

A ‘Common Anti-Addiction Mechanism’: NeuroElectric Therapy in Drug Treatment

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‘Because common mechanisms seem to contribute to at least some aspects of all drug addiction, and possibly to natural addictions as well, it might be possible to develop treatments that would be effective for a wide range of addictive disorders..... A high priority for current research should be to focus on bringing some of the most promising common anti-addiction mechanisms into the clinic for broad trials across several addictive disorders’

Nestler 2005¹

Treatment for dependency upon any one of the major addictive drugs – heroin and cocaine especially, but also nicotine, and even the benzodiazepines – has proved so unsuccessful despite decades of international clinical research into a range of pharmacological interventions, that Western treatment policy has gradually retreated from abstinence to a ‘harm minimization’ focus. As a result of pharmacology’s limitations in impacting upon the opiate and stimulant Withdrawal Syndromes, and particularly their Protracted Abstinence Syndromes, addiction has become widely accepted as a ‘chronic relapsing condition’², requiring long-term support underpinned by maintenance-prescribing.

But we cannot keep relying on glutted drug markets or reflex maintenance-prescribing as substitutes for effective treatment policies and stratagems. However heated the wide-spread debate on the evidence for or against maintenance-prescribing’s health and crime impacts, or the entwined debate on the social and

¹ Nestler EJ. Is there a common molecular pathway for addiction? Nature Neuroscience Vol 8;11, November 2005

² McLellan AT, Lewis DC, O’Brien CP, Kleber HD. Drug dependence, a chronic medical illness: implications for treatment, insurance and outcome evaluation. J American Medical Assoc 2000; 284(133), 1689-1695.

spiritual costs of a harm-minimization policy, the ever-increasing financial cost of maintenance-prescribing is simply unsustainable.

Another approach, a primarily abstinence approach, does exist, has existed. Medicine using electrostimulation is unquestionably a far more benign intervention than pharmacology, though still the subject of deep scientific controversy as regards efficacy. In its different forms, electrostimulation includes acupuncture, electro-acupuncture, and various applications of transcranial electrostimulation. This chapter describes the background, treatment process and outcomes arising from perhaps the best known application of transcranial electrostimulation for addiction, that of the late Dr Meg Patterson's NeuroElectric Therapy or NET³, a treatment distinguished by its clinical record in treating a wide variety of drugs of dependency - and also because it is clinically potent enough to do so rapidly and without supportive or replacement pharmacology.

Background To A 'Common Anti-Addiction Mechanism'

In 1972, Dr. Meg Patterson was Head of Surgery in the Tung Wah Hospital, Hong Kong. One of her colleagues, Dr. H.L. Wen, a Consultant to the Neuro-Surgical Unit. Wen was extremely interested in investigating the potential of electro-acupuncture analgesia within the Neuro-Surgical Unit. President Nixon's 1972 visit to China opened up the closed country, and Dr. Wen used the opportunity to visit and study the application of electro-acupuncture. At that stage, the Chinese, who believed in the concept of 'walking with both feet' - utilizing both Western and traditional Chinese medicine - had treated over half a million patients with acupuncture-analgesia, with a 90% success rate. In spite of this notable success, they could not explain *how* the treatment worked.

After six weeks, Wen returned to Hong Kong and asked Patterson, as Head of Surgery, to select some patients willing to have electro-acupuncture-analgesia instead of the usual nitrous oxide anesthesia. Unknown to the doctors a number of the patients under treatment in the hospital were addicted to drugs, particularly the easily available heroin and opium. After receiving a preliminary session of stimulation (to assess

³ Meg Patterson, died in July 2002 following a stroke and long illness. Ourselves and others carry on her work, investigating and developing NET in a number of chronic conditions one of which is addiction.

individual response), some of these patients volunteered that either they felt like they had had a dose of their drug or that they had lost their desire for it. Two to three hours later withdrawal and craving would return, to disappear with another 30-40 minute electro-acupuncture treatment.

Using modified standard electro-acupuncture techniques (the 'lung' area in the concha of the ear; a supra-liminal, comfortable level of current; 30-40 minute treatments, twice to three times a day for the first four or five, acute withdrawal days), uniform results were obtained about 10-15 minutes after stimulation began. The patients' eyes, nose and mouth became dry; the aching, shivering and abdominal pain decreased; breathing became regular, and they felt warm and relaxed. Over a period of three months, from January to March, 1973, 40 cases of drug addiction were treated in the Tung Wah Hospital (Wen and Cheung, 1973; see also 'Chasing The Dragon', Hong Kong Television, 1973). Of the 40, 39 were discharged free of drugs (the additional case having cancer, was transferred to another hospital. Up to June 1973, over a hundred patients addicted to heroin or opium, smoked or injected, were treated.⁴

It was Wen who first suggested a possible connection between the electro-acupuncture stimulation and the withdrawal symptoms of drug addiction. However, when Wen, Patterson, and Dr. S.Y. Cheung, Dr. Wen's senior assistant, investigated the background of acupuncture for addiction, they were informed by Chinese acupuncture experts that this traditional modality had been found to be largely ineffective in dealing with acute withdrawal symptomatology in opium and heroin addicts, and also with nicotine detoxification.

In February of 1973, the neurosurgeon and neurophysiologist Dr Irving Cooper of New York, visited Hong Kong and gave a series of lectures. Dr Cooper was internationally recognized as a pioneer of several new operations and techniques in cryogenic surgery for involuntary brain disorders (including Parkinson's Disease)⁵. At

⁴ Patterson MA. Electro-acupuncture in alcohol and drug addictions. *Clin Med* 1974;81:9-13;

Patterson MA. Acupuncture and neuro-electric therapy in the treatment of drug and alcohol addictions. *Aust J Alc Drug Dependence* 1975;2:90-95

Patterson MA. Effects of NeuroElectric Therapy (NET) in drug addiction: an interim report. *UN Bull Narc* 1976;28:55-62.

⁵ Cooper IS, *Chronic Stimulation of Cerebellar Cortex in the Human*, Neural Organisation, 1973, 373.

his lecture to the Tung Wah Hospitals he revealed that he might have discovered a possible means of curing epileptics and spastics by implanting electrodes in the brain by surgery, and then stimulating them by means of a receiver planted in the chest and a pocket transmitter. His theory was that prosthetic stimulation of the cerebellum gradually led to enduring neuro-chemical changes.

Meg Patterson wondered if acupuncture might be a form of electrical stimulation to correct a metabolic imbalance, and the modern practice of electro-acupuncture stimulation simply a more intense form of the 'twirling' practice. For these and other reasons, she rapidly came to believe that it was *only* the electrical factors involved in the treatment that carried therapeutic potential.

Returning to London, England, over 1973-4 Meg Patterson quickly discontinued using needles, electro-acupuncture techniques and electro-acupuncture equipment. She developed instead her own treatment and equipment, based on her belief in the electrical theory and the electro-medical research being conducted in the West and Soviet Union. She named her highly specific application of transcranial electrostimulation 'NeuroElectric Therapy', or 'NET'.

NET Modus Operandi

Meg Patterson's most significant early clinical discoveries were, firstly, that different classes of drugs, and sometimes even within a class, responded to different and highly specific pulse frequencies (egg. heroin, Palfium, codeine, and methadone). For further example, a patient addicted to methadone and Ritalin (the stimulant, methylphenidate) claimed that his craving for methadone disappeared by the third day of treatment, but that his Ritalin craving was totally unaffected. It was only after developing a new stimulator with a wider range of specifications, that it was possible to relieve the Ritalin craving. Her second most significant discovery was that any supportive psycho-pharmacology considerably degraded the efficacy of the stimulation. Furthermore, that giving continuous stimulation (i.e. twenty-four hourly) over the treatment period gave rise to a faster and more effective overall detoxification.

With the discovery of the endorphins, the body's own naturally-occurring morphine in the early 1970's, the bridge between pain and addiction was established and the process of understanding the underlying mechanisms of addiction, craving, and withdrawal begun. The theoretical basis for NET in drug and alcohol detoxifications, is that, utilizing minute amounts of electricity, the electrostimulation re-establishes or stabilizes the natural levels of neurotransmitters intractably disrupted by chronic substance use/abuse. With the development of increasingly advanced and sophisticated electrostimulators, it became possible to investigate clinically, and later scientifically, the significance of each of the current components, and their relationship to each other in the context of addiction treatments. The development of neurotransmitter research by other investigators, in particular the effects of specific electrical signals on neurotransmitter production and other functions, in the laboratory as well as the clinic environment, provided an increasingly clearer picture of the probable neurochemical mechanisms of NET⁶. For example, it has been shown in humans that β -endorphin levels can be raised either by percutaneous or direct brain stimulation and that they will spontaneously return to their normal base level within 90 minutes in non-pain subjects.⁷

Cheng and Pomeranz studied analgesia in mice, using different pulse frequencies (0.2, 4 or 200 Hz). The least level of analgesia resulted from 0.2 Hz and the greatest from 200 Hz - a frequency that is often used in NET for pain, but again such a high frequency must be used with care. Cheng and Pomeranz found they could completely reverse the 4 Hz analgesia with naloxone, indicating endorphinergic mechanisms, but there was no inhibition at 200 Hz (a later study by Han et al did show some reversibility at 100 Hz with higher doses of naloxone; conversely,

⁶ Capel, ID, Williams DC, Patterson MA. The amelioration of restraint stress by electrostimulation, IRCS Medical Science 1979 7, 634.

Capel, ID, Goode IG, Patterson MA. Tryptophan, serotonin and hydroxyindole acetic acid levels in rat brain following slow or fast frequency electrostimulation, IRCS Medical Science 1982, 10, 427-428.

⁷ Sjolund B, Terenius L, Eriksson M. Increased cerebrospinal fluid level of endorphins after electro-acupuncture, Acta Physiology Scandinavia 1997, 100, 382-384.

Akil H, Richardson DE, Hughes J, Barchas JD. Enkephalin-like material elevated in ventricular cerebrospinal fluid of pain patients after analgetic focal stimulation, Science 1978, 201, 463-465;

Salar G, Job I, Mingrino S. et al. Effects of transcutaneous electrotherapy on CSF beta-endorphin content in patients without pain problems, Pain 1981, 10, 169-172.;

parachlorophenylalanine, a serotonin formation inhibitor, partially blocked 200 Hz analgesia but showed no effect at 4 Hz, suggesting that the action of the higher frequency may be serotonergic in origin. Our own animal work showed significant effects on the serotonergic system at both 10 Hz and 500 Hz.

In 1990, Han and Sun reported that different CNS neuropeptides (met-enkephalin and dynorphin A) were released in rats by different frequencies of ES; in 1991 this effect was confirmed, by Han and Terenius, in the cerebrospinal fluid (CSF) of humans who were given transcutaneous electric stimulation (TENS) through peripheral skin electrodes placed over certain acupuncture points, at either 2 Hz or 100 Hz.⁸ In addition, Russian colleagues, in particular Professor Valeri Lebedev of the Pavlov Institute in St Petersburg, have described their extensive research to find the optimum parameters which will induce endorphinergic systems in a variety of animal species, and particularly in humans.

Clinically, NET treatment uses combinations of electrical waveform parameters and a strict underlying medical regimen to achieve safe and replicable clinical effects. Self-adhesive electrodes are applied above the mastoid process behind the ear, and the pocket-size stimulator used continuously for 6 to 10 days (4-6 days for nicotine), without replacement or supportive psychopharmacology. The patient is completely mobile during treatment.

Automated detoxification-programs, based primarily on highly specific selections of pulse-frequencies, are utilized according to the individual substance or combination of substances of abuse. Other frequencies are integrated into the overall program, specific to alleviating withdrawal insomnia, craving, and dysphoria, the mood swings of despondency, anxiety, and aggression, traditionally associated with coming off drugs. NET remains unique in its use of multiple-pulse frequencies given over the treatment period as dictated by the individual substance or substances under treatment.

⁸ Han JS, Xie GX, Ding ZX, Fan SG. High and low frequency electroacupuncture analgesia are mediated by different opioid peptides, *Pain* 1984, Suppl 2, 543.

Cheng, RSS, Pomeranz B. Electroacupuncture analgesia could be mediated by at least two pain-relieving mechanisms: Endorphin and non-endorphin systems, *Life Sciences* 1979, 25, 1957-1962.

Han JS, Chen XH., Lisun, S. et al. Effect of low- and high-frequency TENS on met-enkephalin-arg-phe and dynorphin A immunoreactivity in human lumbar CSF, *Pain* 1991, 47, 295-298.

The results of the first, open clinical trial into NET demonstrated that patients could be safely, rapidly, and benignly detoxified from daily drug dosages as large as 300mg of prescribed heroin to 10G of street heroin; 0.5 to 10G of cocaine; 40 to 800mg of methadone; and various narcotic and psychotropic prescription medication up to 70 tablets daily - all treatments *precluded* support or replacement psychopharmacology which degrades the efficacy of the stimulation. In the published eight year's follow-up statistical analysis, 80% of 93 traced patients claimed that they were still drug-free, 78% that they were alcohol-free. The drop-out rate for NET-treated patients over seven years was only 1.6%. By the end of treatment, of 102 consecutive patients 75% claimed that they were free of anxiety, 95% that they were free of craving⁹.

Detoxification and Relapse

'De-toxification' is an innate function of the body. This natural process can be enhanced through improved diet, increased sweating through daily exercise and use of saunas, and light and deep-tissue massage to release drugs and other toxins stored in the body. At the heart of the problem with abstinence-based addiction treatments, lies the fact that 'drug detoxification' has largely been a label applied to medically-supervised, pharmacology-assisted withdrawals of only limited efficacy.

There still is no recognized effective pharmacology for treatment of amphetamine, methamphetamine, or cocaine or crack cocaine addiction. The 'treatment' for both tranquilizer and methadone addictions consists of gradual withdrawal, over periods lasting up to a year. With other drugs, adept use of pharmacology (such as the non-anesthetic naloxone/ clonidine/ benzodiazepine combination for heroin addiction), can rapidly and with relatively little discomfort speed an addict through the worst of the acute withdrawals. *But there is no pharmacological remedy for the chronic withdrawals* (also known as Protracted Abstinence Syndrome), of heroin, methadone, cocaine, methamphetamine, Valium, Ativan, nicotine, or alcohol, all of which can last from months to years. Anti-depressants, tranquilizers, or sleeping tablets only dull the worst of the symptoms

⁹ Patterson MA, Firth J, Gardiner R. Treatment of drug, alcohol and nicotine addiction by NeuroElectric Therapy: analysis of results over 7 years. *J Bioelectricity* 1984;3:193-221.

until the body restores itself, in time – or, as the long and depressing record of abstinence treatment confirms, the individual wearies of struggling and returns to drug use, prescribed or otherwise.

Professor Charles O'Brien and his colleagues of the University of Pennsylvania Addiction Research Center, have identified four primary causes in relapse to drug-taking¹⁰:

1. Protracted Abstinence Syndrome
2. Psychiatric disorders, especially depression and anxiety disorders.
3. Social factors, including employment opportunities and social support
4. Conditioned responses.

The acute withdrawals of any given drug may pass fairly rapidly, as with the 2-3 days of heroin, or continue for another few days. However, the Protracted Abstinence Syndrome, the on-going craving and sickness and despondency of the addict, lasts for weeks, months or even years. Further research by the University of Pennsylvania Addiction Research Center, has shown that 60-80% of relapse occurs within the first six months post-treatment.

If a detoxification is offered that leaves an addict malaised and craving instead of rapidly restored to physical, emotional and mental well-being, then is it any wonder that treatment is so unattractive to so many addicts and that drug-taking is so frequently resorted to by those driven to enter into treatment? That so many experienced health professionals consequently consider addiction to be a chronic disease of little hope? That addicts despair of becoming drug-free?

What is of paramount importance - what *should be* of paramount importance - is the hope of treatment effecting change: with the individual under care, with their family and important relationships, and within their social and work life. With change there is hope. With hope there is motivation to enter into treatment and to persist in treatment until drug-free lives can be reclaimed.

With this very different approach to drug treatment, there *is* change.

¹⁰ O'Brien CP, Childress AR, McLellan AT. Conditioning factors may help to understand and prevent relapse in patients who are recovering from drug dependence. NIDA Res Monogr 1991;106:293-312

Effecting Change

Over thirty years and some eight countries, Meg Patterson's detoxification tool has consistently demonstrated:

- *Low Drop-Out Rate.* The degree of withdrawal relief provided by NET (between 50-75% for the majority of patients, greater relief with a minority) is substantial enough to maintain an exceptional proportion of addicts in treatment, anywhere between 80-100% of patients.
- '*Good compliance*' and low incidence of drug use during treatment (Gariti et al, 1992)
- *Minimal craving* upon completion of NET. 95% of patients claimed NO craving after NET – Patterson et al., 1984.
- By the end of 6-10 days of NET, patients can expect to feel physically well, emotionally stable and mentally clear – exceptionally well placed to engage in rehabilitation activities.
- Delivering rapid and potent detoxification without having to resort to support or replacement psychopharmacology, reinforces the message that drugs – whether prescribed or non-prescribed – are not essential for coping.
- *Low Relapse Rate.* Through the compound effect of all the above treatment benefits, NET consistently delivers and supports low relapse of between 10%-40% (non-relapse here is defined a no further drug use, including prescribed psychopharmacology).

These outcomes were demonstrated first by Meg Patterson¹¹, and then shown to be replicable elsewhere.

¹¹ Patterson MA, Firth J, Gardiner R. Treatment of drug, alcohol and nicotine addiction by NeuroElectric Therapy: analysis of results over 7 years. *J Bioelectricity* 1984;3:193-221

NET Outcomes: Sussex, UK

- Treatment deliverers: private/charity funded
- Treatment setting: in-patient & out-patient treatments
- Substances treated: all drugs incl. poly-drug treatment
- Outcomes: 186 patients. Treatment completion rate 98.4%, abstinence rate 80% (Patterson et al, 1984)

NET Outcomes: Somerset NHS, UK

- Treatment deliverers: National Health Service
- Treatment setting: in-patient facility
- Substances treated: all drugs incl. poly-drug treatment
- Outcomes: 72 patients. Treatment completion rate 100%, abstinence rate 90%¹²

NET Outcomes: Univ. of Penn, USA

- Treatment deliverers: University of Pennsylvania, Addiction Research Centre / Veteran's Administration
- Treatment setting: in-patient controlled investigation
- Substances treated: heroin, methadone, and cocaine dependencies
- Outcomes: 75 subjects. Pre-study pilot subjects, and both study controls appeared to show treatment efficacy (Gariti et al, 1992)

NET Outcomes: Neerim South, Australia

- Treatment deliverers: local community organization
- Treatment setting: primarily at-home, with local community support and supervision.
- Substances treated: all drugs incl. poly-drug treatment
- Outcome: 80 patients. Treatment completion rate 75% (half of drop-outs returned for further treatment), abstinence rate approx. 2 in 3

¹² Prof K. Schmidt. 'Does the Government drugs policy work?' Presentation to House of Commons Home Affairs Committee, September 2001.

Dr. Patterson believed electrostimulation's potential in addiction treatment stemmed from its ability to effect significant change starting with the most fundamental and potent of changes: the return to physical well-being, and a subsequent realization that it is possible to feel good without recourse to chemicals. With such transition comes a profound consequence, a changed belief system and belief that further change is possible.

However, NET itself is only a detoxification tool, and detoxification, while a critical treatment element, is only part of the treatment process and challenge. The physical well-being, emotional stability and mental clarity imparted by this modality has to be integrated into a follow-through rehabilitation programme, that is, a treatment process that seeks to address the issues underlying and reinforcing the addiction. This phase itself should then lead to community reintegration and support. NET must thus be part of an overall treatment plan and cannot function, or be utilized, in isolation from these other fundamental treatment elements.

Yet it is patently clear that no one organization has the skills or experience let alone resources, to deliver the complete addiction continuum of care: outreach, assessment, detoxification, rehabilitation, and community re-integration. In order to put forward recommendations for the wider treatment context within which NET can be used – and especially, *most effectively* be used – we have developed, and are continuing to develop, innovative models of partnership working between different organizations, and also between the different sectors involved in addiction treatment service delivery, as the resolution to this most primary of dilemmas.

NET Outcomes: Tijuana, Mexico

- Treatment deliverers: Church-based charity /community organizations
- Treatment setting: in-patient, also on an out-reach basis
- Substances treated: all drugs incl. poly-drug treatment
- Outcome: 450 patients. Treatment completion rate 98%, abstinence rate (data unavailable)

Dr. Patterson's clinic for the poor of Tijuana¹³ was the original model for this partnership approach. A probationary relationship was developed between this NET detoxification clinic and a group of twenty-three local rehabilitation/community organizations, a working relationship which went on to prove itself in practice. This convergence of specialist skill, focus, and limited resources has created a number of strategic advantages for the treatment providers *and* those seeking treatment:

1. Short-notice access to a detoxification bed once clients have been assessed as suitable for treatment
2. Predictable detoxification timetable of 6-10 days, to within 28-48 hours
3. Guarantee of immediate access to rehabilitation placement following completion of detoxification

The 'Tijuana model' has subsequently formed the basis of further applications of the partnership-working strategic principle. Adapted to local circumstances, this flexible model was recently integrated into a national treatment approach developed in Romania between NET and the State Anti-Drugs Agency, NGOs, and community groups. Here, NET detoxification potential is forming the pivot for a pilot in a national incidence-reduction strategy to addressing drug addiction, in a country where addiction is still a first-generational rather than cross-generation problem (nevertheless, like most other countries, addiction in Romania is already a poly-substance abuse challenge). The initial and successful 'road-testing' of NET has taken place in Arad, north-western Romania, in an outreach approach again involving different statutory and NGO organizations.

¹³ The *Casa Filadelfia* clinic opened only two weeks before her stroke in November of 1999. See revised edition of 'Dr Meg', now published as 'Searching For The Impossible', 2005, available through www.classictravelbooks.com or www.amazon.com/books .

NET Outcomes: Arad, Romania

- Treatment deliverers: State medical, NGO, social workers, community organizations Treatment setting: residential
- Substances treated: all drugs incl. heroin, methadone, ketamine, amphetamine, cocaine, alcohol, benzodiazepine, cannabis and nicotine, typically in poly-drug treatments
- Outcomes: 25 patients. Treatment completion rate 88%, abstinence rate 90%

Related to the Romanian project through the connection of the Criminal Justice System, has been another collaborative initiative, in Kentucky, USA. With oxycontin ('hillbilly heroin') and methamphetamine in particular making serious inroads into rural America, this endeavor has significant implications for regional American communities with little or no access to traditional treatment resources let alone effective treatment for stimulant dependency; but also for the over-burdened Criminal Justice System, including Probation Service, struggling disproportionately with drug-related crime.

NET Outcomes: Kentucky, USA

- Treatment deliverers: community organizations, private & State medicine, & the Court/ Criminal Justice System
- Treatment setting: residential facility
- Substances treated: poly-drug treatment including methamphetamine, cocaine, heroin, oxycontin, methadone, benzodiazepines, alcohol and nicotine
- Outcomes: 48 patients. Treatment completion rate 94%, abstinence rate 95%

With NET as a principal tool for the large-scale introduction of an achievable and practical abstinence outcome potential into treatment, it is our conclusion that this clinical-innovation, in combination with the potential arising from innovative working partnerships, is the most promising approach we have for addressing the urgent policy challenges identified by addiction researchers and policy formulators¹⁴: that of significantly increasing access to treatment, including financial access; and of significantly increasing the capacity of treatment services. This potent combination of innovations also lays the groundwork for re-introducing an abstinence policy focus

¹⁴ Dackis C , O'Brien CP. 'Neurobiology of addictions: treatment and public policy ramifications'. Neurobiology of Addictions 2005, Vol 8;11, 1431-1436

and support to addiction treatment, though from a very much more robust, supportable and sustainable basis than has been hitherto deliverable.

Support

If the underlying science of electrostimulation is still only partially understood, the clinical guidelines underlying effective abstinence-objective treatment, as outlined in this chapter, are no longer a mystery: consistent application of highly specific electrical wave-forms as dictated by the condition under treatment, strict adherence to clinical procedures such as electrode placement and polarity, and the contraindication of supportive or replacement psychopharmacology along with the electrostimulation. The observable as well as reported outcomes are independently replicable and produce low treatment drop-out and relapse rates regardless of differences in drugs of dependency, differences in drug-using cultures, differences in integral rehabilitation and relapse-prevention modalities, and very different treatment service-deliverers.

Or have we become so completely habituated to prescribing practices that no other approach can receive serious consideration?

NeuroElectric Therapy and other applications of electrostimulation are given the appellation 'controversial', not only because the scientific basis of the approach is still being established, but also because the approach challenges many entrenched attitudes and assumptions. 'And yet it does move', replied Galileo to those who demanded he recant his heresy. As history demonstrates, while heresy may be unpalatable it is also often the first vital step to innovation, advancement, and ultimately, reform. If Nestler's call for bringing the 'most promising common anti-addiction mechanisms into the clinic for broad trials across several drugs' is to be heeded, then the lucid and demonstrable principles, applications and outcomes of this innovative non-pharmacological treatment modality must be made a priority for research - and support.

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